



Oral & Maxillofacial Surgery & Dental Implants - OS 531**Revision - Odontogenic Infections (Questions & Model Answers)**

1. Mention the Etiology of infections of the head & neck:

- Odontogenic causes: Dentoalveolar, pericoronal, & residual infections
- Trauma: Compound jaw fracture or physical or chemical trauma to bone
- Postoperative infection
- Spread from maxillary sinus or salivary glands
- Hematogenous origin
- Iatrogenic causes, e.g. Contaminated needle or instruments

2. Mention the Etiology of Odontogenic infections of the head & neck:

- Pulpal disease
- Periodontal disease
- Pericoronal infection
- Remaining root fragments
- Residual infection
- Infected cyst or tumour

3. Mention the three clinical stages of odontogenic infection:

- Periapical osteitis: occurs when infection is localized within alveolar bone. Although the tooth is sensitive to percussion and often slightly extruded, there is no soft tissue swelling
- Cellulitis develops as infection spreads from bone to adjacent soft tissues. Subsequently, patient develops a diffuse swelling.
- Suppuration then occurs & infection localizes into a discrete, fluctuant abscess.

4. Mention Microbiology of odontogenic H & N infections in different stages:

- In initial stages of inoculation & periapical osteitis, it' is mostly Aerobic streptococci & Aerobic Staphylococci
- In Cellulitis stage , it is Mixed Aerobic & Anaerobic bacterial infection
- In Abscess stage, it is mostly Anaerobic bacterial infection: Streptococci, Peptostreptococci, Bacteroids, Fusobacterium

**5. Mention the Historical Data related to odontogenic head & neck infections:**

- Previous or Current Dental pain
- Previous or Current dental procedures (RCT, Extraction, others)
- Previous or Current Antibiotic treatment
- Previous or Current Swelling

6. Describe Cardinal signs & symptoms of odontogenic head & neck infections:

- Pain & Tenderness due to pressure on sensory nerves from edema
- Redness due to vasodilatation from inflammation
- Hotness due to vasodilatation & increased blood flow
- Swelling (Cellulitis: accumulation of fluid exudates/ Abscess: pus accumulation)
- Loss of function (Trismus, Dysphagia, Difficulty in breathing)

7. Describe Constitutional signs & symptoms of Acute odontogenic infections:

- Fever > 38 degree
- Malaise / Lethargy / Fatigue / Loss of appetite / Headache / loss of weight
- Tachycardia / increased respiration
- Lymphadenopathy
- Leukocytosis > 10,000 /ml³
- Elevated ESR : elevated 30-70 mm/hr

8. Describe Radiographic signs of acute & chronic Dento-alveolar infection:

- Early Acute: no radiographic signs before 14 days except PDL space widening
- Late Acute DA infection: discontinuity of Lamina dura at apical region +/- irregular periapical radiolucency
- Chronic DA infection: irregular radiolucent area of rarefaction around apex
- Low-grade Chronic DA infection: sclerotic border around radiolucent area

9. Mention Laboratory tests used to help diagnosis of Head & Neck infections:

- Aspiration Biopsy to detect pus
- Culture & Sensitivity Test
- Complete Blood Count (CBC)
- White cell count (Differential WBC)
- Erythrocyte Sedimentation rate (ESR)

**10. Mention Imaging modalities used to help diagnosis of H & N infections:**

- Panoramic
- Occlusal
- Periapical
- Computerized Tomography (CT)
- Magnetic resonance imaging (MRI) & Scintigraphy: limited to special cases

11. Mention the Predisposing Factors for head & neck infections :

- Metabolic disease
- Immuno-compromising diseases
- Immuno-compromising drugs
- Deficient Local blood supply

12. Mention the Fate of Dento-alveolar infection :

- Acute stage limited to bone without soft tissue involvement
- Chronic stage limited to bone without soft tissue involvement
- Acute exacerbation of an existing Chronic stage
- Involvement of surrounding soft tissues (Cellulitis, Subperiosteal abscess, Vestibular abscess, Fascial space abscess)
- Osteomyelitis
- Resolution in high immunity, low virulence & early management
- Fatal complications due to: serious ascending or descending infection & metastatic Hematogenous spread, in low immunity, high virulence & neglected or faulty management

13. Mention the usual pattern of Spread of untreated Dento-alveolar infection :

- Diffuse Spread to surrounding soft tissues (Cellulitis)
- Localized Spread to surrounding soft tissues (Subperiosteal abscess)
- Deeper Spread either as Vestibular abscess or Fascial spaces abscess
- Spread to the Maxillary sinus
- Osteomyelitis of jaw bone
- Spread to Lymph nodes
- Hematogenous spread by Bacteremia, Toxemia, & Septicemia

**14. Mention Factors that determine Fate & Spread of infection from specific tooth**

- Virulence of Organism
- Number / Dose of microorganisms
- Host resistance
- Thickness of bone & root length
- Point of penetration of infection in relation to muscle attachment

15. Define Fascial spaces:

- Fascial spaces potentially exist between fascial layers & may become filled with purulent material from spreading orofacial infections. Spaces that become directly involved are termed spaces of primary involvement. Infections may spread to additional spaces, which are termed secondary .

16. List the Cervical Fascia :

- Superficial Cervical Fascia
- Deep Cervical Fascia : Superficial layer , Middle layer, & Deep layer

17. Mention the Primary Fascial spaces related to maxillary infection:

- Vestibular space
- Base of the Upper lip
- Infraorbital (Canine) space
- Buccal Space
- Infratemporal space

18. Mention the Primary Fascial spaces related to mandibular infection:

- Vestibular space
- Buccal Space
- Sublingual space
- Submental space
- Submandibular space

19. Mention the Secondary Fascial & Deep neck spaces related to OI:

- Submasseteric space
- Pterygomandibular space



- Deep Temporal space
- Superficial Temporal space
- Lateral pharyngeal space
- Retropharyngeal space
- Parotid space
- Orbital & Periorbital spaces
- Prevertebral & Pretracheal space
- Carotid Space

20. Mention the Serious Complications arising from Fascial space infections:

- Cavernous sinus thrombosis
- Brain abscess & meningeal inflammation
- Serious Orbital complications (Visual impairment)
- Ludwig's angina
- Septic Shock
- Mediastinitis
- Respiratory impairment (Dyspnea – Stridor)
- CNS impairment (decreased level of consciousness, headache, vomiting)

21. Mention the Fatal Fascial space infections :

- Base of the Upper Lip
- Orbital & Periorbital space
- Infratemporal Space
- Deep Temporal space
- Pterygomandibular space
- Lateral Pharyngeal space
- Retropharyngeal space
- Ludwig's angina

22. Classify Degree of risk of infections in any of the Fascial spaces:

- Low Severity spaces: Do not threaten the airway or vital structures:- Vestibular, Buccal, & Infraorbital spaces.

- Moderate Severity spaces: Hinder access to airway due to swelling, tongue elevation, or trismus:- Infratemporal space, Masticator spaces (Submasseteric, Pterygomandibular, Superficial & Deep Temporal); & Suprahyoid (Perimandibular) spaces (Submandibular, Sublingual, & Submental), & Parotid
- High Severity spaces: Directly obstruct or deviate the airway or threaten vital neural or vascular structures:- Base of upper lip, Lateral Pharyngeal, & Retropharyngeal.

23. List Fascial spaces most likely involved in spread of infection to Cavernous sinus & explain its Venous Drainage:

- Base of Upper Lip: Angular vein & Ophthalmic veins (superior & inferior)
- Orbital & Periorbital spaces : Ophthalmic veins (superior & inferior)
- Infratemporal space : Pterygoid venous plexus
- Deep Temporal spaces: Pterygoid venous plexus

Anteriorly

Posteriorly

24. What are the causes of Cavernous Sinus Thrombosis?

- Hematogenous spread of maxillary odontogenic infection via the venous drainage of the maxilla.
- Lack of valves in the facial veins permits organisms to flow to & contaminate the cavernous sinus, thus resulting in thrombosis.

25. List the signs of Cavernous Sinus Thrombosis:

- Abrupt onset of unilateral periorbital edema
- Periorbital edema could easily progress to other eye
- Drooping or bulging eyes (proptosis)
- Decrease or loss of vision from venous congestion or hemorrhage within retina
- Headache / Fever
- Neurological signs due to Paralysis of involved cranial nerves III, IV, V, VI

26. Mention what comprises the Masticator spaces:

- Submasseteric space
- Pterygomandibular space
- Temporal spaces (Superficial & Deep Temporal)

27. Describe the clinical picture & course of a patient with Ludwig's Angina:

- Diffuse firm swelling of Submental & submandibular spaces bilaterally
- All cardinal & Constitutional signs & symptoms of infection
- Elevation of floor of mouth
- Elevation & /or protrusion of Tongue
- Difficulty in Breathing due to airway compromise
- Dysphagia & Drooping of saliva
- Pain is radiating to ear & neck
- Confusion or Impairment of consciousness

28. Describe the treatment of a patient with Ludwig's Angina & define how their airway management problems are treated:

- Hospitalization
- Massive intravenous antibiotic therapy
- Incisions & drainage + placement of through-&-through drains
- Tracheostomy, or endotracheal intubation for airway competence

29. List causes of death in Fatal Ludwig's Angina:

- Septic Shock
- Respiratory Obstruction (Stridor, inability to assume supine position)
- CNS impairment

30. Describe muscles of Facial expression & their relationship to FS infections:

- | | | |
|---------------------|---|--|
| <div>Maxilla</div> | { | • Orbicularis Oris: infections (from incisors) above or below muscle attachment determine a vestibular space infection or Base of upper lip infection |
| | | • Levator Anguli Oris : infections (from canine) above or below muscle attachment determine a vestibular space infection or an Infraorbital infection |
| <div>Mandible</div> | { | • Buccinator: infections (from premolars & molars) above or below muscle attachment determine a vestibular space infection or a Buccal space infection |
| | | • Mentalis: infections (from incisors) above muscle attachment determine a vestibular space infection |
| | | • Depressor Anguli Oris : infections (from canine) above muscle attachment determine a vestibular space infection |

31. Mention the Goals (Aim , Objectives) of Treatment of Odontogenic Infections:

- Airway protection (Tracheostomy, endotracheal intubation)
- Eliminate the odontogenic cause of infection (Extraction or RCT)
- Elevate the patients immunity & support medical status of patient
- Eliminate & drain all purulent material (Surgical drainage : I & D)
- Select appropriate Antibiotic therapy (C & S Test)
- Enhance circulation, oxygenation & healing of infected area (Supportive Th.)
- Prevent recurrence of infection (Adequate definitive treatment + follow up)

32. List step-by-step procedures for management of patients with Head & Neck infections (Principles of Therapy as defined by Peterson) :

- Case Evaluation: Determining Severity of Infection / Evaluate host Defense
- Clinical Examination: Extraoral, Intraoral including dental, bone, ST, & LN
- Radiographic Examination: Panoramic, Occlusal, CT, MRI, & Scintigraphy
- Laboratory Tests: Blood tests, & culture & sensitivity tests
- Treatment planning: Indications for ER referral & / or Treatment by OMFS
- Definitive Treatment: Surgical, Medical support, Antibiotics
- Follow-up of patients for regular evaluation

33. Mention Indications for ER referral (Hospitalization & Treatment by OMFS) :

- Rapid progressive cellulitis
- Difficulty in breathing
- Difficulty in swallowing
- Severe fascial space infection especially those of high risk spaces
- Fever above 39 degrees
- Trismus less than 2 cm interincisal opening
- Compromised host defenses

34. Mention Definitive Treatment modalities used to treat Dentoalveolar infections:

- Surgical: Incision & Drainage, Extraction, Apical Surgery + RCT
- Supportive Therapy: Rest, Fluid, Soft diet, Minerals, Heat Therapy
- Medical Tr.: Empirical Antibiotics, Specific AB after Culture & Sensitivity testing

**35. Mention the requirements of Incision & Drainage:**

- Aspiration Biopsy: 18-gauge needle to detect pus accumulation & for C & S test
- LA : in non-infected area around abscess
- Incision: Blade no. 11 used for at least 1 cm incision at most dependant area
- Blunt Dissection: Hemostat inserted in all abscess cavity to open partitions
- Irrigation: Ñ Saline +/- Hydrogen peroxide +/- Antibiotic solution
- Placement of Drain: sutures stabilized to maintain wound patency
- Follow up : every 24 hrs : Irrigation + drain

36. Mention the components of Supportive therapy for infection:

- Rest / Analgesics to control pain & fever
- Hydration: Fluid intake to overcome Dehydration
- High-caloric Nutritious Soft Diet
- Nutritional Supplements: vitamins & minerals
- Systemic diseases monitoring
- Warm mouthwash / Heat Therapy to promote healing after Fever subsides

37. What are the principles of antibiotic therapy ?

- Determine the Necessity for AB use
- Use Empirical Therapy routinely
- Use the Narrow Spectrum AB
- Use AB with lowest incidence of Toxicity & SE
- Use Bactericidal AB if possible
- Administer AB Properly
- Consider the Cost of entire AB therapy

38. What are the Indications for antibiotic therapy ?

- Rapidly progressive swelling
- Diffuse Cellulitis / Acute stage
- Compromised host defenses
- Involvement of fascial spaces
- Severe Pericoronitis
- Osteomyelitis

**39. What are the general guidelines for antibiotic administration?**

- Proper dose: considering (MIC) minimal inhibitory concentration, Dose should be 4-5 times > MIC.
- Proper time interval: considering the (PHL) plasma elimination half-life of drug, Interval should be 4 times > PHL
- Adequate period for prescription: Not less than 72 hours (3 Days); & Continued for 2 - 3 days after infection has resolved, usually total of 6 -7 days.
- Proper route of administration (oral - parenteral) usually initial loading dose IV or IM then followed by oral D.
- Combination Antibiotic therapy: for mixed infections (aerobic & anaerobic)

40. What are the antibiotics of choice for odontogenic infection ? List in priority order. OR What is the empirical antibiotic regimen for odontogenic infection?

- Penicillins / Amoxicillin : in conjunction with Metronidazole in mixed infection
 - Amoxicillin + Clavulanate (inhibit β -Lactamase) in early aerobic stage
 - Metronidazole alone
 - Clindamycin alone
- } In Chronic / anaerobic infection
- Erythromycin / Azithromycin in penicillin allergy
 - Cephalexin / Cefadroxil / Ceftadizime: in severe cases or immuno-compromised

41. Despite the advent of numerous new antibiotics, penicillin remains the drug of choice for odontogenic infections. Why?

- It is bactericidal with a narrow spectrum of activity that includes the most common pathogens associated with odontogenic infection.
- It is safe; the toxicity associated with penicillin is low.
- It is cheap. A 10-day supply of penicillin cost under \$5, compared, for example, with Augmentin, which costs the patient approximately \$70.

42. Mention the Indications for Culture & Sensitivity Tests:

- Rapidly & Vigorously Spreading infection
- Postoperative infection / or Nosocomial Infections
- Non-responsive infection – Resistant strains
- Recurrent infection



- Compromised host defenses
- Osteomyelitis / Actinomycosis

43. Mention Indications for Prophylactic Antibiotic therapy :

- To Prevent Wound infection after surgery in suspected patients
- Prevent Metastatic infection in cardiac patients or those with prosthetic implants
- Prevent prolongation of illness in high risk patients (medically compromised)

44. What are the disadvantages of Prophylactic Antibiotic therapy :

- Alter host flora
- Useless in low risks
- Encourage lax surgical technique
- Cost of AB
- Toxicity of AB

45. Mention the causes of Treatment Failure :

- Wrong Diagnosis
- Inadequate Surgery
- Depressed Host defenses
- Presence of Foreign body
- Antibiotics problems :
 - Patient non-compliance
 - Too low dose
 - Wrong AB / Wrong Bacterial diagnosis
 - Drug not reaching site

46. Define Osteomyelitis of the jaws & mention the causative organism.

- Inflammation of all layers of bone: Starting by medullar cavity (bone marrow) & Cancellous bone with high tendency to spread; Then it spreads to Cortical bone; Then extends to the periosteum.
- The causative organism: mainly Anaerobic (Streptococci , Peptostreptococci, & Fusobacterium)

47. Why is Osteomyelitis show high incidence in mandible more than maxilla?

- Decreased vascularity than maxilla,
- More amount of dense compact bone
- Mandible is more subject to trauma & fracture as well as difficult extractions

48. What are the Predisposing factors for the development of Osteomyelitis?

⇒ Uncontrolled Metabolic Diseases :

- Diabetes / End-stage renal diseases
- Alcoholism / Drug addiction
- Malnutrition

⇒ Immuno-suppressive Diseases :

- Lymphoma Leukemia , Anemia / immuno-compromising diseases

⇒ Immuno-suppressive Therapies :

- Cancer Chemotherapy / Radiotherapy
- Steroids / Organ Transplant therapy
- Bisphosphonates used in Osteoporosis

49. What are the clinical types of Osteomyelitis ?

- Acute Suppurative Osteomyelitis
- Acute Progressive Osteomyelitis
- Chronic Suppurative or Non-Suppurative Osteomyelitis
- Chronic Focal Sclerosing Osteomyelitis
- Chronic Diffuse Sclerosing Osteomyelitis
- Proliferative Periosteitis (Garre's Osteomyelitis)

50. What are the characteristic cardinal clinical manifestations of Osteomyelitis ?

- Deep constant pain often radiating to the ear
- Firm Cellulitis
- Trismus
- Paresthesia or dysethesia in mandible
- Looseness of teeth
- Pus discharging from PDL
- Discharging sinus tract intraorally or extraorally

51. What are the characteristic radiographic appearance of Osteomyelitis in different types & stages?

- Usually mixed patchy radiolucency known as moth-eaten appearance
- Sequestra surrounded by radio-opaque line
- Focal sclerosis usually around roots
- Diffuse irregular sclerosis along large area of mandible
- Subperiosteal sclerosis known as onion-skin appearance due to cortex duplication

52. What are the other adjunct diagnostic tests used for Osteomyelitis ?

- CT 2D & 3D reconstruction
- MRI for early bone marrow changes
- Scintigraphy using Technetium ^{99m} bone scans for latent sites of increased bone turnover

53. Mention the lines of treatment for Osteomyelitis ?

⇒ Surgical

- incision & drainage / Extraction
- Sequestrectomy /No curetting
- Saucerization: cortex removal + open packing for 2ry healing
- Decortication: cortex removal + periosteum cover medullar bone

⇒ Medical

- Antibiotics – Clindamycin / IV : 3 - 4 days / Orally: 3–4 weeks / 6m
- Hyperbaric Oxygen (HBO) to increase oxygenation of bone in order to counteract bone ischemia & necrosis, promote bone marrow activity & thus support immune system, & combat anaerobic microorganisms.
- Medical consultation for systemic diseases

⇒ Supportive therapy especially heat therapy & fluids

54. What are the problems & complications arising from Osteomyelitis ?

- Resistance to antibiotic therapy due to decreasing effect or local tissue ischemia
- Multiple surgical procedures
- Prolonged treatment

- Loss of several teeth
- Loss of large portions of mandible
- Pathologic (spontaneous) jaw fracture

55. What are the closest differential diagnosis of Osteomyelitis ?

- Actinomycosis
- Osteitis Fibrosa cystica - Hyperparathyroidism

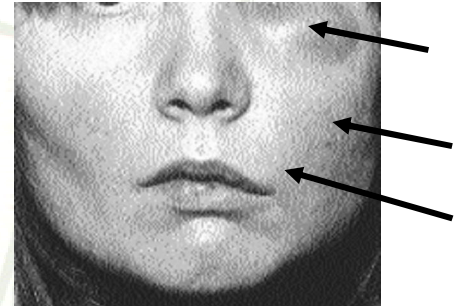
Problem - Solving / Case presentation

A 29-year old female patient gave a 24-hour history of increasing facial pain & swelling, following discomfort from a carious left maxillary canine.

- What clinical type of infection does this mostly represent ?

A: Acute facial space infection spreading from dentoalveolar infection

(Reason: rapidly increasing swelling & pain over just one day, evident swelling of left face below the eye, over the cheek & obliterating the naso-labial fold)



- Which anatomical spaces does the infection occupy?

A: Infraorbital space & periorbital space

(Reason: swelling in the canine-infraorbital region lateral to the nose & obliterating the naso-labial fold; & swelling of the lower eyelid)

- What investigations are indicated?

A: General, Clinical, Radiographic & laboratory examination is required.

⇒ General (temperature & other vital signs) & Clinical extraoral (don't forget LN) & intraoral examination (don't forget mouth opening, vestibular or Subperiosteal swelling)

⇒ Panoramic view as a standard for overall record, then CT is mandatory to detect the exact extension of infection & possibility of serious complication



⇒ Laboratory tests: CBC, WBCs differential, & ESR at least.

⇒ Culture & Sensitivity test if needed later .

- What could be the serious complication in this case if not adequately treated ?

A: Cavernous sinus thrombosis due to the rapid involvement of periorbital space & retrograde spread to the Cavernous Sinus through ophthalmic veins.

- What are likely to be the main elements of treatment?

⇒ **A: First:** control spread of infection by **empirical antibiotic therapy** to put patient in Subacute stage. In this rapidly progressing infection IV antibiotic administration is required at the beginning then followed by oral administration. If there is limited response to prescribed antibiotics, then C & S test is needed.

Second: supportive therapy including fluids 2-3 liters / day, nutritional supplements, & analgesics, soft diet, & rest.

Third: Remove the cause of infection by **extraction of canine or RCT. Incision & drainage of the abscess** by intraoral incision 1.5 cm. at the labial sulcus opposite the canine, with blunt dissection, irrigation with normal saline +/- Cefadroxil antibiotic, then & placement of drain for 2-3 days.

Fourth: if patient presented CNS involvement (visual symptoms, depressed conscious, others) then immediately is referred to ER for suspecting cavernous sinus thrombosis.
